SIEMENS

PATENT

Attorney Docket No.2002P19478WOUS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor:	A.R. Beeck et al.	)	Group Art Unit:	1791
		)		
Serial No.:	10/551,740	)	Examiner:	J.M. Sanders
		)		
Filed:	September 30, 2005	)	Confirmation No.	4282

Title: METHOD FOR PRODUCING CERAMIC OBJECTS

Mail Stop Appeal Brief - Patent
COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

APPELLANT'S BRIEF UNDER 37 CFR 41.37

This brief is in furtherance of the Notice of Appeal filed in this application on April 12th, 2010.

1. REAL PARTY IN INTEREST - 37 CFR 41.37(c)(1)(i)

The real party in interest in this Appeal is the assignee, Siemens Aktiengesellschaft.

2. RELATED APPEALS AND INTERFERENCES - 37 CFR 41.37(c)(1)(ii)

There is no other appeal, interference or judicial proceeding that is related to or that will directly affect, or that will be directly affected by, or that will have a bearing on the Board's decision in this Appeal.

3. STATUS OF CLAIMS - 37 CFR 41.37(c)(1)(iii)

Claims pending: 17-18 and 21-28

Claims cancelled: 1-16, 19-20 and 29-35.

Claims withdrawn but not cancelled: None.

Claims allowed: None.

Claims objected to: None.

Claims rejected: 17-18 and 21-28.

The claims on appeal are 17-18 and 21-28.

4. STATUS OF AMENDMENTS - 37 CFR 41.37(c)(1)(iv)

A response was filed on 09 March 2010 under 37 CFR 1.116 without claim amendment following the final rejection. The response was considered but the rejections were sustained according to the Advisory Action dated as mailed 03/16/2010.

5. SUMMARY OF THE CLAIMED SUBJECT MATTER- 37 CFR 41.37(c)(1)(v)

This invention relates generally to a process for producing ceramic objects 1, such as ceramic components and ceramic molds, from a ceramic powder (page 1, lines 10-11). **Independent claim 17** is directed to a process for producing a shaped object 1 from a powder bed (page 2, line 26; page 3, line 14). The process includes preparing a powder bed having a first powder mix in a first region and a second powder mix in a second region (page 3, lines 16-18; page 4, lines 33-34). The first and second powder mixes differ from each other in chemical composition and/or powder particle size distribution (page 4 line 34 – page 5 line 1). The process further includes forming a first region 4 of the shaped object 1 by a first laser sintering of the first powder mix (page 5, line 2), and forming a second region 7 of the shaped object 1 integral with the first region 4 by a second laser sintering of the second powder mix (page 5, line

3). The process further includes controlling a laser beam generated during the first and second laser sintering processes to produce a different sintering temperature over the first and second regions of the object, creating a different degree of densification in the first and second regions of the shaped object (page 5, lines 5-8). The forming of the first and second regions 4,7 includes controlling the respective laser sintering step to provide different material properties in the first and second regions of the shaped object (page 2, line 33; page 3, line 14).

6. GROUNDS OF REJECTION TO BE REVIEWED UPON APPEAL - 37 CFR 41.37(c)(1)(vi)

A. Claims 17-18, 21-26 and 28 stand rejected under 35 USC 103 as being unpatentable over Deckard (U.S. Patent No. 4,863,538), in view of Sachs et al. (U.S. Patent No. 5,340,656) and further in view of Lewis et al. (U.S. Patent No. 5,837,960).

B. Claim 27 stands rejected under 35 USC 103 as being unpatentable over Deckard in view of Sachs et al. and Lewis et al., and further in view of Loschau ("Ceramics: Getting into the 2000's").

7. ARGUMENT 37 CFR 41.37(c)(1)(vii)

A. Response to Rejection of Claims 17-18, 21-26 and 28 under 35 USC 103

Arguments applicable to all claims:

The Appellee rejected independent claim 17 under 35 USC 103 as being unpatentable over Deckard in view of Sachs et al. and Lewis et al. Independent claim 17 recites the step of preparing a powder bed having a first powder mix in a first region and a second powder mix in a second region, where the first and second powder mixes differ from each other in the chemical composition and/or powder particle size distribution. Additionally, independent claim 17 recites the step of forming a first/second region of the shaped object by a first/second laser sintering of the first/second powder mix, and that the respective first/second laser sintering is controlled to provide different material properties in the first and second regions of the shaped object. Additionally, independent claim 17 recites controlling a laser beam generated during the respective first/second laser sintering processes, to produce a different sintering temperature over the first and second regions of the object, creating a different degree of densification in the first and second regions of the shaped object. None of the Deckard, Sachs et al., or Lewis et al.

references, alone or in combination, discloses these recitations, and accordingly, independent claim 17 is patentable.

Deckard discloses a confinement structure 28, which receives a single type of powder from a powder dispenser 14 (see FIG. 1; col. 4, lines 40-45). Various optics are arranged, to align a laser 12 into the powder of the confinement structure 28, and undergo a scan pattern 66 (see FIG. 2), based on a driver 50 and galvanometer 48 (col. 5, lines 33-47). Various layers 54-57 of the powder 22 are formed within the dimensions of the confinement structure 28 (see FIG. 2; col. 5, line 45), and various scan modes of the laser 12 may be utilized, to adjust the patterns formed on each layer 54-57 (col. 6, lines 13-24).

The Appellee contended that Deckard discloses a first powder mix in a first region, where the first powder mix is formed by a first laser sintering of the first powder mix, and cited to FIGS. 1-2 and col. 5 line 64 – col. line 2, in support thereof (September Office Action, p. 2-3). The Appellee conceded that Deckard fails to disclose a second powder mix in a second region; that the first and second powder mixes differ from each other in chemical composition and/or powder particle size distribution; and the step of forming a second region of the shaped object integral with the first region by a second laser sintering of the second powder mix; looked to Sachs et al. to provide this noted deficiency, and cited to col. 11, lines 15-20 in support thereof (September Office Action, p. 3). However, this portion of Sachs et al. merely teaches that two types of powder "can be applied via two or more separate powder dispersion heads so as to deposit the different powders at different regions of the part being formed" (col. 11, lines 16-20). Sachs et al. generally involves forming a component by depositing a layer of powder in a region, depositing a binder material to selected regions of the powder material, and then repeating these steps to achieve layers of bonded powder material, while removing unbonded powder (Abstract). Indeed, Sachs et al. fails to disclose the step of forming a second region of the shaped object integral with the first region by a second laser sintering of the second powder mix, as contended by the Examiner. Instead, Sachs et al. discloses that a second powder mix should be applied through a second dispersion head, onto the surface of a component. In response, the Appellee argued that it would have been obvious "to form a second region of the shaped object integral with the first region by a second laser sintering of the second powder mix," as such a modification would amount to "nothing more than the duplication of parts for a multiple effect," and cited to MPEP 2144.04(VI) and *In Re Harza*, 274 F.2d 669, in support thereof (Final Office

Action, p. 9-10). However, the "duplication of parts" principle of MPEP 2144.04(VI)(B) is inapplicable, as the suggested duplication of the dispersion heads of Sachs et al. necessarily amounts to the elimination of the laser 12 in Deckard, since successive layers would be bonded using the binder material of Sachs et al., as discussed below, and thus the proposed combination would not disclose the claimed invention via. a "duplication of parts." Additionally, the Appellee misrepresented the law, by conveniently excluding the "new and unexpected result" exception to the "duplication of parts" principle. MPEP 2144.04(VI)(B). Relative to the proposed modification of the prior art (i.e., multiple dispersion heads which spray layers of powder, separated by a binder material), the recited step of forming a second region of the shaped object integral with the first region by a second laser sintering of the second powder mix does produce a new and unexpected result. Indeed, none of the cited prior art references, alone or in combination, disclose the step of forming a second region of the shaped object integral with the first region by a second laser sintering of the second powder mix. Accordingly, independent claim 17 is patentable.

In the Amendment filed on November 13, 2009, with regard to the rejection of independent claim 17, the Appellants argued that the suggested modification of Deckard, based on Sachs et al., would render Deckard unsatisfactory for its intended purpose, and thus the suggested modification could not be used to support the rejection of independent claim 17, per MPEP 2143.01. Specifically, the Appellants argued that Deckard discloses forming layers 54-57 of the powder 22 within the structure 28, based on an alignment of the laser 12 with associated optics, and that Sachs et al. discloses layering two types of respective powders in respective regions, by alternately applying powder layers to each region through a dispersion head and a successive binder material between each respective powder layer. (November 13 Amendment, p. 5). The Appellants argued that, if Deckard was modified based on the teachings of Sachs et al., "for benefit of producing shaped objects with regions of different materials," as suggested by the Appellee, this would necessarily involve moving the powder 22 from the structure 28 of Deckard into a dispersion head, where it would be successively applied to form layers, in between which a binder material would be applied, as taught in Sachs et al., and thus the laser 12 and optics disclosed in Deckard would be discarded and unneeded. (November 13 Amendment, p. 5-6). In response, the Appellee argued that "there is no teaching away involved with this element and thus would not render Deckard unsatisfactory for its intended purpose." (Advisory

Action, p. 2). The Appellee misstated the law, as an express teaching away of replacing the laser 12 and optics of Deckard with the multiple dispersion heads is not required for such an arrangement to render Deckard unsatisfactory for its intended purpose. Additionally, the Appellee argued that "A fundamental concept of Deckard is the build up of a part in a layer-by-layer manner, and Deckard teaches a portion of powder 22 is deposited in the target area 26 and selectively sintered by the laser beam 64 to produce a sintered layer (col. 5, lines 55-67)." (Final Office Action, p. 11). However, this contention fails to address, let alone refute, the Appellant's contention that the powder 22 in Deckard would be moved from the structure 28 to the dispersion head, and the powder would be layered using the binder material of Sachs et al. Additionally, the Appellee argued that "Since Sachs et al. teaches that the first and second powders are individually applied from separate dispersion heads, another dispersion head would be added for the second powder." (Final Office Action, p.11) However, even if Deckard was modified, such that the powder 22 was positioned in a first dispersion head, and a second powder was positioned in a second dispersion head, this arrangement would nevertheless fail to disclose the claimed invention, as such an arrangement would involve: (1) successively applying a first and second powder layer into respective first and second regions, and (2) successively applying a binder material in between each successive powder layer in the first and second region, to form the layer structure and selectively vary the material properties of the first and second regions (col. 11, lines 15-25). Thus, even if Deckard was modified as suggested by the Appellee, and two dispersion heads were used, this arrangement would still render Deckard unsatisfactory for its intended purpose. The Appellee further argued that "Clearly, one of ordinary skill in the art would also, while depositing the first and second powders of a layer, move the dispersion heads in such a way so as not to interfere with the performance of the laser, optics, and thus the sintering process." (Final Office Action, p. 11) and similarly, the Appellee later argued "one of ordinary skill in the art would also, while depositing the first and second powders of a layer, move the dispersion heads in such a way so as not to interfere with the performance of the laser, optics and thus the sintering process." (Advisory Action, p.2) The Appellee's argument mischaracterized the Deckard and Sachs et al. references, which fail to provide any teaching or suggestion as to how to "move the dispersion heads in such a way as not to interfere with the performance of the laser." The Appellee presumed that one of ordinary skill in the art would somehow develop a method of: (1) applying a layer of first and second powder from a first and

second dispersion head, and (2) use the laser 12 of Deckard in some fashion with these applied powder layers. Neither Deckard nor Sachs et al. teaches any such arrangement or method. As discussed above, the only layering method of powder involving the application of powder from the dispersion head involves a successive application of a binder material in between the successive layers. The Appellee engaged in improper hindsight by using the Appellant's specification, rather than any prior art reference, to combine the references, since the contention that the dispersion heads would be moved "in such a way" as to not interfere with the performance of the laser is wholly unsupported by any teaching of the prior art. For example, where would the dispersion heads be positioned, relative to the system of Deckard? How would the laser 12 power be adjusted when sintering the different types of powder from each dispersion head? Would the two dispersion heads spray the first and second powders into a common area or into two separated areas? These are just one of several unanswered questions, based on the Appellee's contentions, and demonstrate that the Appellee resorted to improper hindsight, in rejecting independent claim 17. Accordingly, the proposed modification cannot form a basis of the rejection of independent claim 17, per MPEP 2143.01.

In the November 13 Amendment, the Appellants pointed out that the Appellee conceded that neither Deckard or Sachs et al. disclose that the respective first/second laser sintering is controlled to provide different material properties in the first and second regions of the shaped object, as recited in independent claim 17, and cited to col. 4, lines 20-21 and col. 21 lines 14-22 of Lewis et al. to provide this noted deficiency (November 13 Amendment, p. 6). These portions of Lewis et al. merely disclose that one object of the invention is "to produce articles having variable density" and that density of an article may vary with laser power and/or a feed rate of powder which is melted by the laser (col. 21, lines 14-22). The Appellants emphasized that Lewis et al. merely discloses a melting process, and thus teaches away from a sintering process, which is a method for making objects from powder by heating the powder to below its melting point until the particles adhere to each other (November 13 Amendment, p. 6). Thus, the Appellants argued that Lewis et al. fails to disclose that the respective first/second laser sintering is controlled to provide different material properties in the first and second regions of the shaped object, as recited in independent claim 17. In the Final Office Action, the Appellee contended that "Lewis et al. teach decreasing laser power results in less melting of the powder, thus reducing density (col. 22, lines 1-8). Therefore, it is inherent that powder particles not melted

adhere to each other." (Final Office Action, p. 12). As the Appellee is aware, "'In relying upon the theory of inherency, the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.' Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original)" MPEP 2112. In response to the requested basis in fact and/or technical reasoning, not only did the Appellee fail to provide such, but the Appellee renewed the previous inherency claim, "incomplete melting is equivalent to sintering" (Advisory Action, p. 2) and expressly based the rejection on a wholly unsupported opinion that "sintering" occurs in one of two types, "solid state sintering" and "liquid state sintering…a method in which at least one but not all of the elements exist in a liquid state." (Advisory Action, p.2). Thus, the Appellee attempted to use an unsupported inherency claim (sintering has two types) as a basis for an unsupported inherency claim (incomplete melting is equivalent to sintering). As stated above, the Appellee has engaged in improper hindsight, and used the Appellant's specification and claims as the basis for modifying the references, as well as the basis for the unsupported inherency claims. In fact, the Appellee provided no basis in fact or technical reasoning, other than unsupported opinion, to support the inherency claims. Thus, melting and sintering are distinct processes requiring very different environmental conditions. The fact that something does not melt is by no means a basis for assuming that it will sinter. Thus, the Appellee must provide a basis in fact or reasonable support for this inherency claim, per MPEP 2112, or the rejection will remain fatally deficient. The Appellee failed to provide any such basis of fact or reasonable support in the Advisory Action. Accordingly, the rejection of independent claim 17 is fatally deficient.

Accordingly, independent claim 17 is patentable. Its dependent claims, which recite yet further distinguishing features, are also patentable, and require no further discussion herein.

B. Response to Rejection of Claim 27 under 35 USC 103

As discussed above, independent claim 17 is patentable. Claim 27, which recites yet further distinguishing features, is also patentable, and requires no further discussion herein.

8. CLAIMS APPENDIX - 37 CFR 41.37(c) (1) (viii).

A copy of the claims involved in this appeal is attached as a claims appendix under 37 CFR 41.37(c) (1) (viii).

9. EVIDENCE APPENDIX - 37 CFR 41.37(c) (1) (ix)

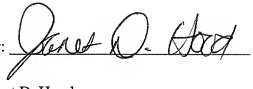
None is required under 37 CFR 41.37(c) (1) (ix).

10. RELATED PROCEEDINGS APPENDIX - 37 CFR 41.37(c) (1) (x)

None is required under 37 CFR 41.37(c) (1) (x).

Respectfully submitted,

Dated: May 19, 2010

By: 

Janet D. Hood
Registration No. 61,142
(407) 736-4234

Siemens Corporation
Intellectual Property Department
170 Wood Avenue South
Iselin, New Jersey 08830

APPENDIX OF CLAIMS ON APPEAL

17. A process for producing a shaped object from a powder bed, comprising:

preparing a powder bed having a first powder mix in a first region and a second powder mix in a second region, the first and second powder mixes differing from each other in at least one of chemical composition and powder particle size distribution;

forming a first region of the shaped object by a first laser sintering of the first powder mix;

forming a second region of the shaped object integral with the first region by a second laser sintering of the second powder mix; and

controlling a laser beam generated during the first and second laser sintering processes to produce a different sintering temperature over the first and second regions of the object creating a different degree of densification in the first and second regions of the shaped object;

wherein the forming of at least one of the first and second regions comprises controlling the respective laser sintering step to provide different material properties in the first and second regions of the shaped object.

18. The process of claim 17, wherein a ceramic mold is formed.

21. The process of claim 18, further comprising at least one of an additional laser sintering process and a hot isostatic pressing of the ceramic mold to achieve any further densification.

22. The process of claim 17, further comprising accessing a computerized representation of the object and using the computerized representation to control the process for producing the ceramic shaped object.

23. The process of claim 18, further controlling the process to form the first region of the ceramic mold to comprise a shell and the second region of the ceramic mold to comprise a core disposed in a cavity of the shell.

24. The process of claim 18, wherein the first region of the ceramic mold comprises an inner region and the second region of the ceramic mold comprises an outer region and the process is controlled so that the inner region is denser than the outer region of the mold.

25. The process of claim 17, further comprising using a ceramic powder or a powder mixture comprising grain sizes of less than 30 μm for at least one of the regions of the object.

26. The process of claim 17, further comprising using a ceramic powder and a powder mixture comprising grain sizes of less than 30 μm for at least one of the regions of the object.

27. The process of claim 17, wherein at least one of the powder mixes comprises at least one ingredient that affects densification and/or sintering of the powder by producing a liquid phase for at least one of the regions of the object.

28. The process of claim 18, wherein the process is controlled to provide a surface in an inner region of the ceramic mold comprising a surface roughness different from an outer region of the ceramic mold.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.